LUMINARY MICRO®

Stellaris® LM3S8962 Evaluation Board

USER'S MANUAL

EK-LM3S8962-06

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CHAPTER 1

Stellaris® LM3S8962 Evaluation Board Overview

The Stellaris® LM3S8962 Evaluation Board is a compact and versatile evaluation platform for the Stellaris LM3S8962 ARM® Cortex™-M3-based microcontroller. The evaluation kit design highlights the LM3S8962 microcontroller's integrated CAN and 10/100 Ethernet controllers.

As well as implementing an embedded web server, the kit functions as a complete controller area network (CAN) by providing two boards each with a Stellaris microcontroller. The main evaluation board (EVB) is the CAN host. A small CAN device board, linked with a ribbon cable, uses a Stellaris LM3S2110 microcontroller. The function of each board is fully configurable in software.

You can use the EVB either as an evaluation platform or as a low-cost in-circuit debug interface (ICDI). In debug interface mode, the on-board microcontroller is bypassed, allowing connection of the debug signals to an external Stellaris microcontroller target. The kit is also compatible with high-performance external JTAG debuggers.

This evaluation kit enables quick evaluation, prototype development, and creation of application-specific designs for Ethernet and CAN networks. The kit also includes extensive source-code examples, allowing you to start building C code applications quickly.

Figure 1-1. Stellaris LM3S8962 Evaluation Board Layout

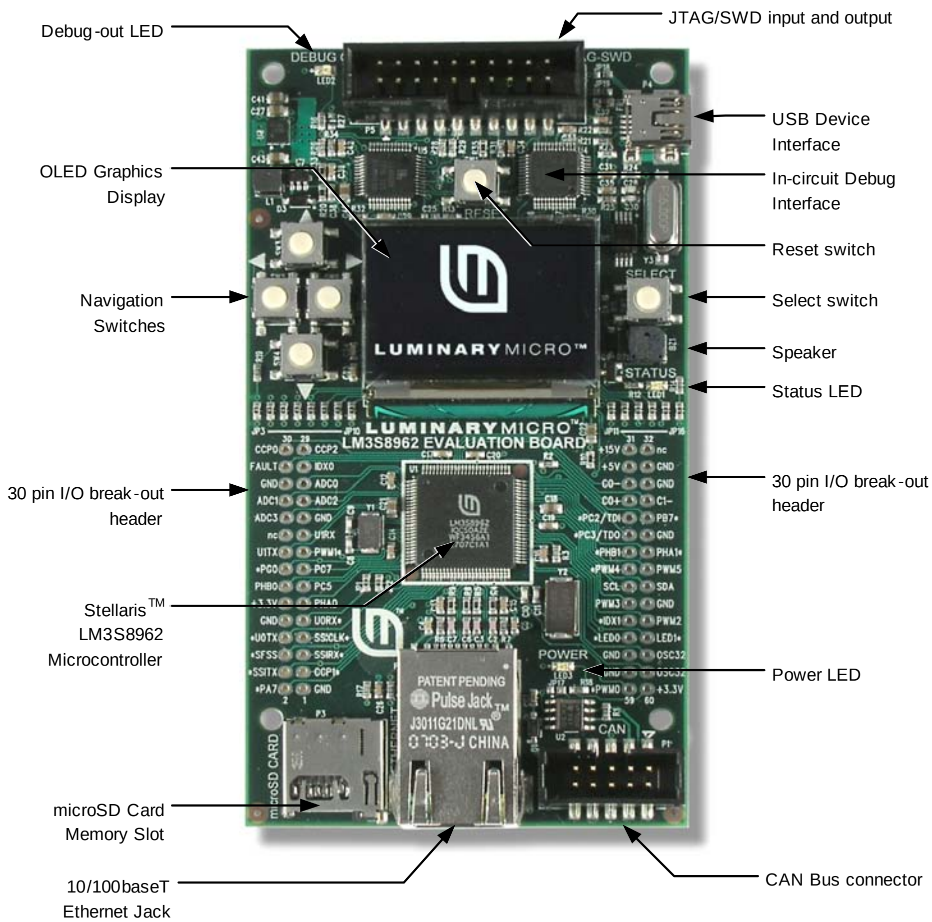
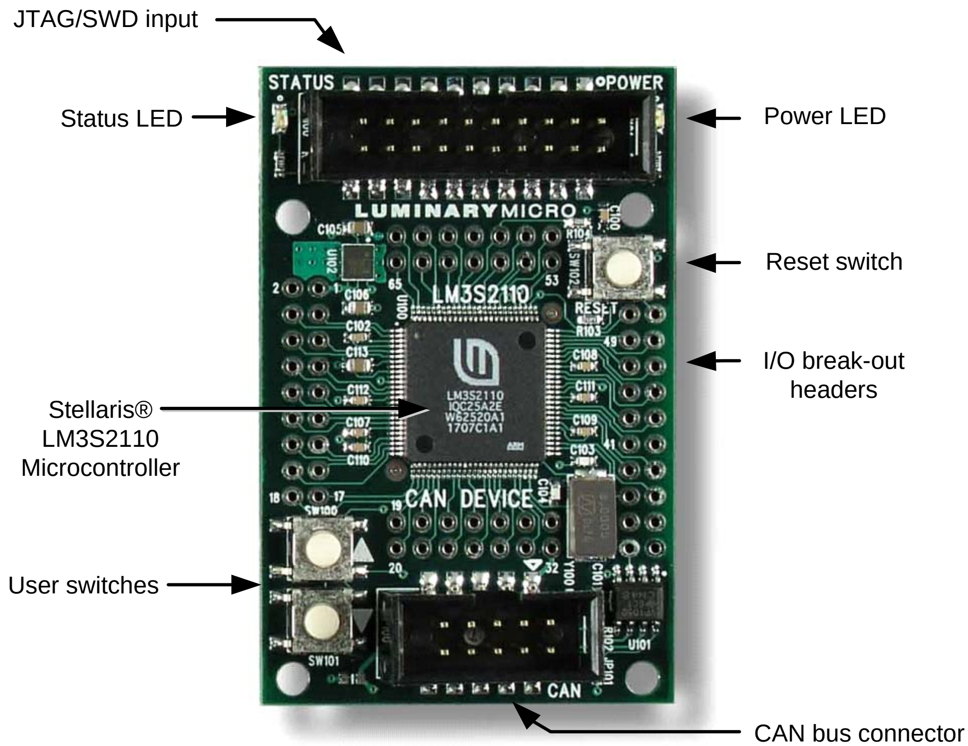


Figure 1-2. Stellaris LM3S2110 CAN Device Board



Features

The Stellaris LM3S8962 Evaluation Kit includes the following features:

- Stellaris LM3S8962 microcontroller with fully-integrated 10/100 embedded Ethernet controller and CAN module
- Simple setup; USB cable provides serial communication, debugging, and power
- OLED graphics display with 128 x 96 pixel resolution
- User LED, navigation switches, and select pushbuttons
- Magnetic speaker
- MicroSD card slot
- USB interface for debugging and power supply
- Standard ARM® 20-pin JTAG debug connector with input and output modes
- LM3S8962 I/O available on labeled break-out pads
- Standalone CAN device board using Stellaris LM3S2110 microcontroller

Block Diagram

Figure 1-3. LM3S8962 Evaluation Board Block Diagram

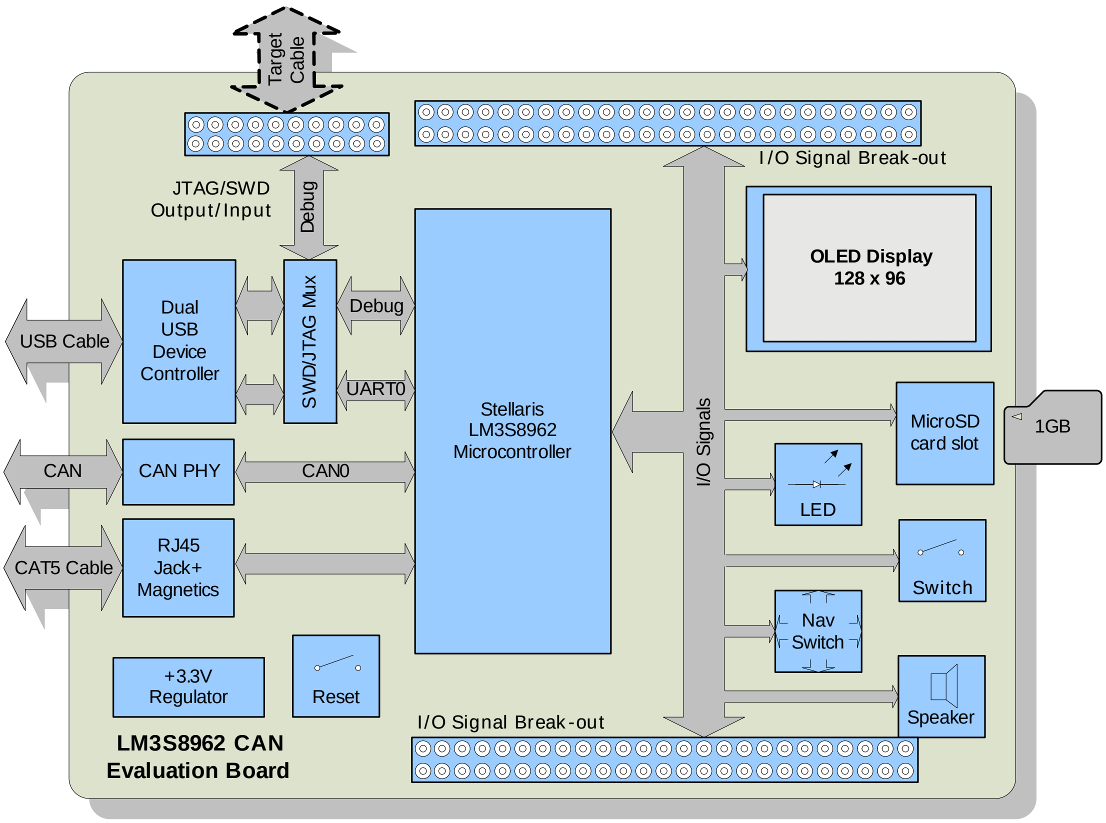
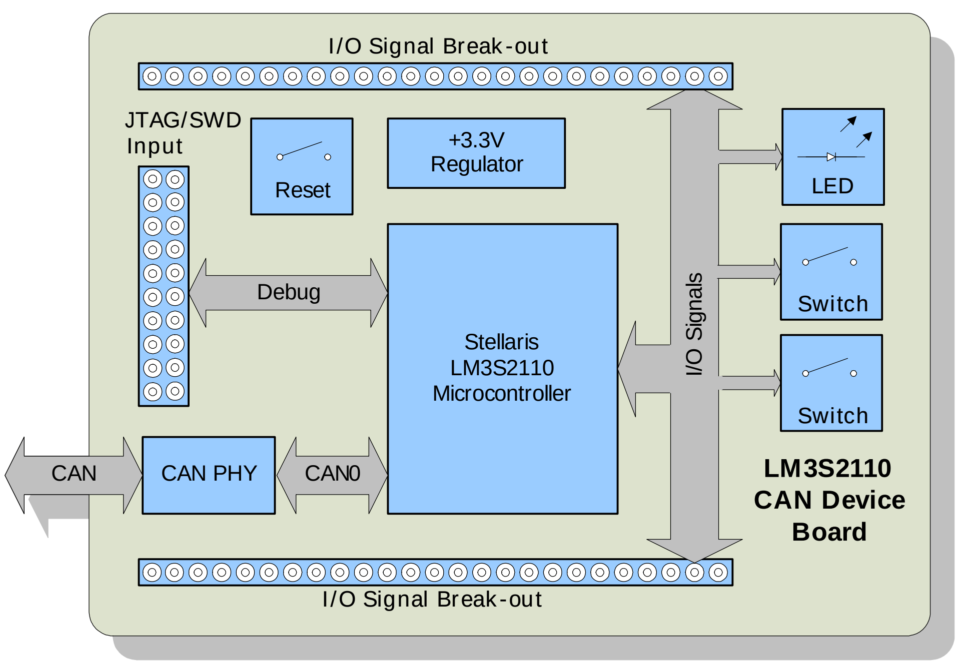


Figure 1-4. LM3S2110 CAN Device Block Diagram



Evaluation Kit Contents

The evaluation kit contains everything needed to develop and run applications for Stellaris microcontrollers including:

- LM3S8962 evaluation board (EVB)
- LM3S2110 CAN device board
- USB cable
- 20-pin JTAG/SWD target cable
- 10-pin CAN cable
- CD containing:
  - A supported version of one of the following:
    - Keil™ RealView® Microcontroller Development Kit (MDK-ARM)
    - IAR Embedded Workbench
    - Code Sourcery GCC development tools
    - Code Red Technologies development tools
  - Complete documentation
  - Quickstart guide
  - Quickstart source code
  - Stellaris® Firmware Development Package with example source code

Evaluation Board Specifications

- Board supply voltage: 4.37–5.25 V_{dc} from USB connector
- Board supply current: 240 mA typ (fully active, CPU at 50 MHz)
- Break-out power output: 3.3 V_{dc} (60 mA max), 15 V_{dc} (15 mA max)
- Dimensions: 4.55” x 2.45” x 0.7” (L x W x H)
- RoHS status: Compliant

Features of the LM3S8962 Microcontroller

- 32-bit RISC performance using ARM® Cortex™-M3 v7M architecture
  - 50-MHz operation
  - Hardware-division and single-cycle-multiplication
  - Memory protection unit (MPU), provides a privileged mode for protected operating system functionality
  - Integrated Nested Vectored Interrupt Controller (NVIC)
  - 42 interrupt channels with eight priority levels
- 256-KB single-cycle Flash
- 64-KB single-cycle SRAM
- Four general-purpose 32-bit timers

- Integrated Ethernet MAC and PHY
- Controller area network (CAN) module
- Three fully programmable 16C550-type UARTs
- Four 10-bit ADC channels (inputs) when used as single-ended inputs
- One integrated analog comparator
- One I^2C module
- Two PWM generator blocks
  - One 16-bit counter
  - Two comparators
  - Produces two independent PWM signals
  - One dead-band generator
- Two QEI modules with position integrator for tracking encoder position
- Two synchronous serial interfaces (SSIs)
- 0 to 42 GPIOs, depending on user configuration
- On-chip low drop-out (LDO) voltage regulator

C H A P T E R 2

LM3S8962 Evaluation Board Hardware Description

In addition to a microcontroller, the Stellaris LM3S8962 evaluation board includes a range of useful peripherals and an integrated in-circuit debug interface (ICDI). This chapter describes how these peripherals operate and interface to the microcontroller.

LM3S8962 Evaluation Board

LM3S8962 Microcontroller Overview

The heart of the EVB is a Stellaris LM3S8962 ARM Cortex-M3-based microcontroller. The LM3S8962 offers 256-KB Flash memory, 50-MHz operation, an Ethernet controller, a CAN module, and a wide range of peripherals. Refer to the LM3S8962 data sheet (order number DS-LM3S8962) for complete device details.

The LM3S8962 microcontroller is factory-programmed with a quickstart demo program. The quickstart program resides in the LM3S8962 on-chip Flash memory and runs each time power is applied, unless the quickstart has been replaced with a user program.

Ethernet

A key feature of the LM3S8962 microcontroller is its fully integrated Ethernet controller. Only an RJ45 jack with integrated magnetics and a few passive components are needed to complete the 10/100baseT interface. The RJ45 jack incorporates LEDs that indicate traffic and link status. These are automatically managed by on-chip microcontroller hardware. Alternatively, the LEDs can be software-controlled by configuring those pins as general-purpose outputs.

The LM3S8962 supports automatic MDI/MDI-X so the EVB can connect directly to a network or to another Ethernet device without requiring a cross-over cable.

CAN Module

A CAN module enables highly reliable communications at up to 1 Mbits/s. The LM3S8962 evaluation board includes a standard CAN transceiver and a 10-pin CAN connector whose signal assignments follow a commonly used CAN standard. A simple adaptor (not included in the kit) can be used to allow the use of standard DB-9 CAN cables (as specified by CAN in Automation CiA DS102).

An on-board 120-ohm resistor provides bus termination. This resistor can be removed if the board is not a network endpoint.

The CAN transceiver is configured in hardware to support speeds up to 1 Mbits/s. A resistor can be added to reduce the transceiver's drive slew-rate for slower data rates over longer distances.

Clocking

The LM3S8962 microcontroller has four on-chip oscillators, three are implemented on the EVB. An internal 12 MHz oscillator is the clock source the microcontroller uses during and following POR. An 8.0-MHz crystal completes the LM3S8962’s main internal clock circuit. An internal PLL, configured in software, multiplies this clock to 50-MHz for core and peripheral timing. The internal 12MHz oscillator is the primary clock source during start-up.

A small, 25-MHz crystal is used by the LM3S8962 microcontroller for Ethernet physical layer timing and is independent of the main oscillator.

Reset

The LM3S8962 microcontroller shares its external reset input with the OLED display. In the EVB, reset sources are gated through the CPLD, though in a typical application a simple wired-OR arrangement is sufficient.

External reset is asserted (active low) under any one of three conditions:

- Power-on reset
- Reset push switch SW1 held down
- Internal debug mode—By the USB device controller (U4 FT2232) when instructed by debugger

Power Supplies

The LM3S8962 is powered from a +3.3-V supply. A low drop-out (LDO) regulator regulates +5-V power from the USB cable to +3.3-V. +3.3-V power is available for powering external circuits.

A +15-V rail is available when the OLED display power supply is active. The speaker and the OLED display boost-converter operate from the +5-V rail.

Debugging

Stellaris microcontrollers support programming and debugging using either JTAG or SWD. JTAG uses the signals `TCK`, `TMS`, `TDI`, and `TDO`. SWD requires fewer signals (`SWCLK`, `SWDIO`, and, optionally, `SWO` for trace). The debugger determines which debug protocol is used.

Debugging Modes

The LM3S8962 evaluation board supports a range of hardware debugging configurations. Table 2-1 summarizes these configurations.

Table 2-1. Stellaris LM3S8962 Evaluation Board Hardware Debugging Configurations

Mode	Debug Function	Use	Selected by
1	Internal ICDI	Debug on-board LM3S8962 microcontroller over USB interface.	Default mode
2	ICDI out to JTAG/SWD header	The EVB is used as a USB to SWD/JTAG interface to an external target.	Connecting to an external target and starting debug software. The red Debug Out LED will be ON.
3	In from JTAG/SWD header	For users who prefer an external debug interface (ULINK, JLINK, etc.) with the EVB.	Connecting an external debugger to the JTAG/SWD header.

Modes 2 and 3 automatically detect the presence of an external debug cable. When the debugger software is connected to the EVB's USB controller, the EVB automatically selects Mode 2 and illuminates the red Debug Out LED.

Debug In Considerations

Debug Mode 3 supports evaluation board debugging using an external debug interface. Mode 3 is automatically selected when a device such as a Segger J-Link or Keil ULINK is connected.

Boards marked Revision B or later automatically configure pin 1 to be a 3.3-V reference, if an external debugger is connected. To determine the revision of your board, locate the product number on the bottom of the board; for example, EK-LM3S8962-B. The last character of the product number identifies the board revision.

A configuration or board-level change may be necessary when using an external debug interface with revision A of this evaluation board. Because the evaluation board supports both debug out and debug in modes, pin 1 of the 20-pin JTAG/SWD header is, by default, not connected to +3.3 V. Consequently, devices requiring a voltage on pin 1 to power their line buffers may not work.

Two solutions exist. Some debugger interfaces (such as ULINK) have an internal power jumper that, in this case, should be set to internal +3.3 V power. Refer to debugger interface documentation for full details. However, if your debugger interface does not have a selectable power source, it may be necessary to install a 0-Ω resistor on the evaluation board to route power to pin 1. Refer to the schematics and board drawing in the appendix of this manual for the location of this resistor.

USB Device Controller Functions

USB Overview

An FT2232 device from Future Technology Devices International Ltd. manages USB-to-serial conversion. The FT2232 is factory-configured by Luminary Micro to implement a JTAG/SWD port (synchronous serial) on channel A and a Virtual COM Port (VCP) on channel B. This feature allows two simultaneous communications links between the host computer and the target device using a single USB cable. Separate Windows drivers for each function are provided on the Documentation and Software CD.

A small serial EEPROM holds the FT2232 configuration data. The EEPROM is not accessible by the LM3S8962 microcontroller.

For full details on FT2232 operation, go to www.ftdichip.com.

USB to JTAG/SWD

The FT2232 USB device performs JTAG/SWD serial operations under the control of the debugger. A CPLD (U6) multiplexes SWD and JTAG functions and, when working in SWD mode, provides direction control for the bidirectional data line. The CPLD also implements logic to select between the three debug modes. The internal or external target selection is determined by multiplexing `TCK/SWCLK` and asserting $\overline{\texttt{TRST}}$.

Virtual COM Port

The Virtual COM Port (VCP) allows Windows applications (such as HyperTerminal) to communicate with `UART0` on the LM3S8962 over USB. Once the FT2232 VCP driver is installed, Windows assigns a COM port number to the VCP channel.

Serial Wire Out

The evaluation board supports the Cortex-M3 serial-wire output (SWO) trace capabilities. Under debugger control, the CPLD can route the SWO datastream to the virtual communication port (VCP) transmit channel. The debugger can then decode and interpret the trace information

received from the VCP. The normal VCP connection to `UART0` is interrupted when using SWO. Not all debuggers support SWO. Refer to the Stellaris LM3S3748 data sheet for additional information on the trace port interface unit (TPIU).

Organic LED Display

The EVB features an Organic LED (OLED) graphics display with 128 x 96 pixel resolution. OLED is a new technology that offers many advantages over LCD display technology. The display is protected by a thin protective plastic film. If desired the film can be removed using a pair of tweezers.

Features

- RiT P14201 series display
- 128 columns by 96 rows
- High-contrast (typ. 500:1)
- Excellent brightness (120 cd/m^2)
- Fast 10 us response

Control Interface

The OLED display has a built-in controller IC with synchronous serial and parallel interfaces. Synchronous serial (SSI) is used on the EVB as it requires fewer microcontroller pins. Data cannot be read from the OLED controller; only one data line is necessary. Note that the SSI port is shared with the MicroSD card slot. The Stellaris® Firmware Development Package (included on the Documentation and Software CD) contains complete drivers with source-code for the OLED display.

Power Supply

A +15-V supply is needed to bias the OLED display. A FAN5331 device from Fairchild combines with a few external components to complete a boost converter. A GPIO (`PA7`) is assigned to turn on and off the controller as necessary for power rail sequencing. When the OLED display is operating, a small amount of power can be drawn from the +15-V rail to power other devices.

Design Guidelines

The OLED display has a lifetime of about 13,000 hours. It is also prone to degradation due to burn-in, similar to CRT and plasma displays. The quickstart application includes both a screen saver and a power-down mode to extend display life. These factors should be considered when developing EVB applications that use the OLED display.

Further Reference

For additional information on the RiT OLED display, visit www.ritekdisplay.com.

Other Peripherals

Speaker

A small, magnetic audio transducer connects through a MOSFET to `PG1/PWM1`, allowing a range of options for generating simple and complex tones. Use of the +5-V rail reduces switching noise on the +3.3-V rail.

MicroSD Card Slot

Removable Flash cards are an ideal media for storing data such as web page content. The source code on the CD includes example code for reading data from standard FAT-formatted SD cards. All data and control transactions use the SD card's SPI mode. Note that the SD card specification does not require that a card supports the SPI mode, but most cards do so in practice. Cards from several vendors have been used with the EVB.

MicroSD cards are very small and require careful handling. The SD card slot on the EVB is a push-push type (push to insert; push again to eject).

NOTE: To avoid damage, remove power before inserting or removing cards.The EVB does not implement SD card power control.

Push Switches

The EVB has five general-purpose input switches. Four are arranged in a navigation-style configuration. The fifth functions as a Select switch.

User LED

A user LED (`LED1`) is provided for general use. The LED is connected to `PF0/PWM0`, allowing the option of either GPIO or PWM control (brightness control). Refer to the Quickstart Application source code for an example of PWM control.

Bypassing Peripherals

Excluding Ethernet and CAN, the EVB's on-board peripheral circuits require 16 GPIO lines. Two additional GPIO lines are assigned to Ethernet LEDs. This leaves 20 GPIO lines and 4 ADC channels immediately available for connection to external circuits. If an application requires more GPIO lines, the on-board hardware can be disconnected. The EVB is populated with 16 jumper links, which can be cut with a knife to isolate on-board hardware. The process can be reversed by installing 0603- 0-ohm chip resistors. Table 2-2 shows the microcontroller assignments and how to isolate specific pins.

Important*:* The quickstart application will not run if one or more jumpers are removed.

Table 2-2. Isolating On-Board Hardware

Microcontroller Pin	EVB Function	To Isolate, Remove...
Pin 26 `PA0/U0RX`	Virtual COM port receive	JP1
Pin 27 `PA1/U0TX`	Virtual COM port transmit	JP2
Pin 19 `PG0`	SD card chip select	JP4
Pin 30 `PA4/SSI0RX`	SD card data out	JP5
Pin 31 `PA5/SSI0TX`	SD card and OLED display data in	JP6
Pin 28 `PA2/SSI0CLK`	SD card and OLED display clock	JP7
Pin 34 `PA6/CCP1`	OLED display data/control select	JP8
Pin 19 `PG0`	OLED display chip select	JP9
Pin 18 `PG1/PWM1`	Sound	JP10
Pin 61 `PF1/IDX1`	Select switch	JP11

Table 2-2. Isolating On-Board Hardware

Microcontroller Pin	EVB Function	To Isolate, Remove...
Pin 72 `PE0/PWM4`	Up switch	JP12
Pin 74 `PE2/PHB1`	Left switch	JP13
Pin 75 `PE3/PHA1`	Right switch	JP14
Pin 73 `PE1/PWM5`	Down switch	JP15
Pin 47 `PF0/PWM0`	User LED	JP16

Interfacing to the EVB

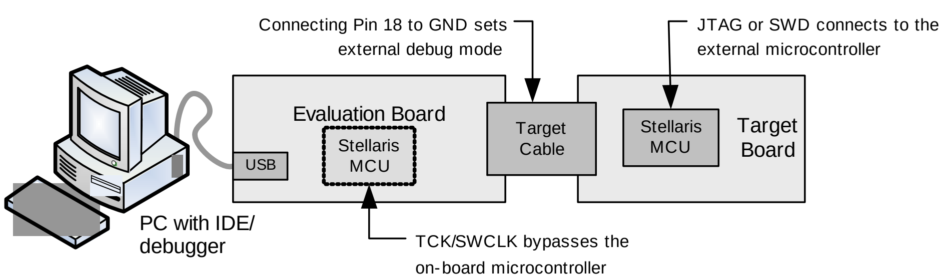
An array of accessible I/O signals makes it easy to interface the EVB to external circuits. All LM3S8962 I/O lines (except those with both JTAG and SWD functions) are brought out to 0.1" pitch pads. For quick reference, silk-screened labels on the PCB show primary pin functions.

Most LM3S8962 I/O signals are +5-V tolerant. Refer to the LM3S8962 microcontroller data sheet for detailed electrical specifications.

Using the In-Circuit Debugger Interface

The Stellaris LM3S8962 Evaluation Kit can operate as an In-Circuit Debugger Interface (ICDI). ICDI acts as a USB to the JTAG/SWD adaptor, allowing debugging of any external target board that uses a Stellaris microcontroller. See "Debugging Modes" on page 16 for a description of how to enter Debug Out mode.

Figure 2-1. ICD Interface Mode



The debug interface operates in either serial-wire debug (SWD) or full JTAG mode, depending on the configuration in the debugger IDE.

The IDE/debugger does not distinguish between the on-EVB Stellaris microcontroller and an external Stellaris microcontroller. The only requirement is that the correct Stellaris device is selected in the project configuration.

CAN Device Board Hardware Description

The CAN device board uses a Stellaris LM3S2110 microcontroller to demonstrate a complete two-node network. The board can be used with the main LM3S8962 evaluation board or as a standalone board.

Device Overview

The Stellaris LM3S2110 ARM Cortex-M3-based microcontroller has 64-KB Flash memory, 25-MHz operation, a CAN module, and a wide range of peripherals. For complete device details, see the LM3S2110 data sheet (order number DS-LM3S2110).

The LM3S2110 microcontroller is factory programmed with a quickstart demonstration program that adds a remote volume control feature to the quickstart application. The quickstart program resides in the LM3S2110 on-chip Flash memory and runs each time power is applied, unless the quickstart has been replaced with a user program.

Power Supply

The CAN device board receives +5.0-V power from the CAN bus and should not be connected to a CAN bus that has a power wire voltage of greater than 10.0 V. If the bus is unpowered, a +5.0-V local power supply must be provided. The LM3S2110 microcontroller is powered from a +3.3-V rail, supplied by a low drop-out (LDO) regulator. +3.3-V power is available for powering external circuits.

Programming and Debugging

A standard 20-pin header supports both JTAG And SWD programming and debugging using either the main LM3S8962 board in ICDI out mode or a full-featured debug interface.

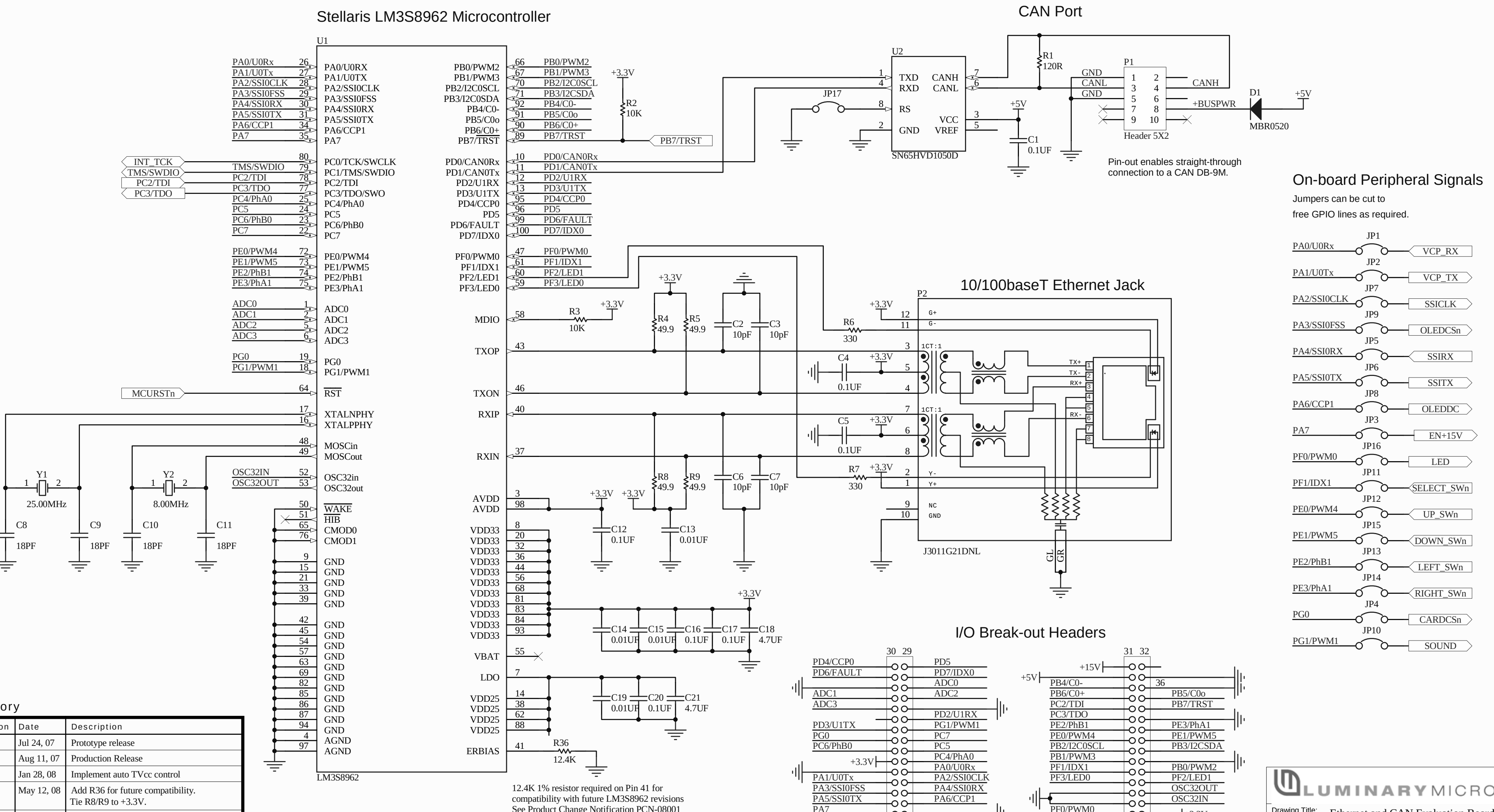
Interfacing

Two push switches and an LED implement a very simple user interface. The board's capabilities are easily expanded using the I/O breakout headers. For breakout header signal assignments, see "LM3S2110 CAN Device Board Connections" on page 33.

APPENDIX A

Schematics

This section contains the schematics for the LM3S8962 Evaluation Board.

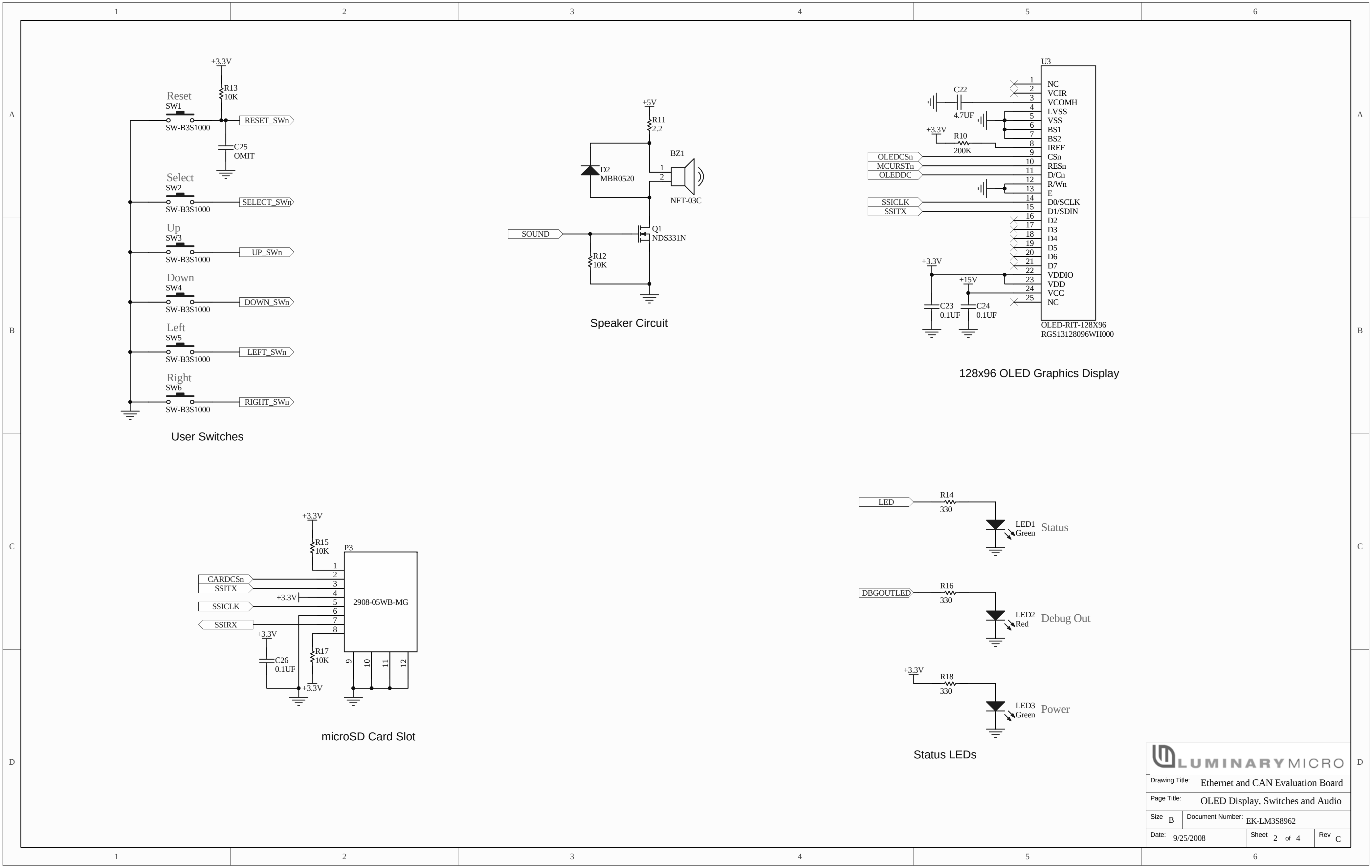


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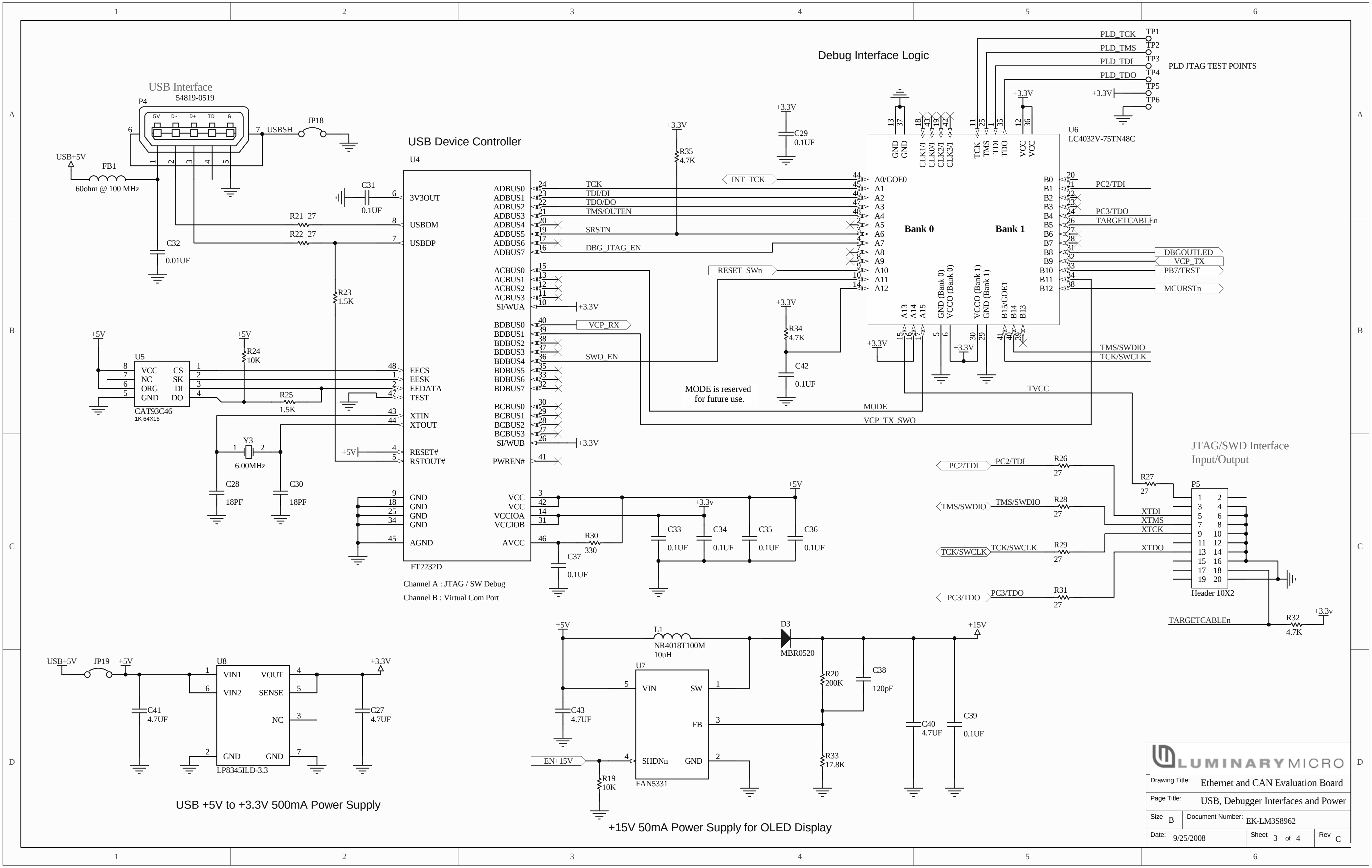
Revision	Date	Description
0	Jul 24, 07	Prototype release
A	Aug 11, 07	Production Release
B	Jan 28, 08	Implement auto TVcc control
C	May 12, 08	Add R36 for future compatibility. Tie R8/R9 to +3.3V.
	Jul 10, 08	Fix labels for JP3-16
	Sept 25, 08	Fix net names for some GPIO (Rev C1 PCB)

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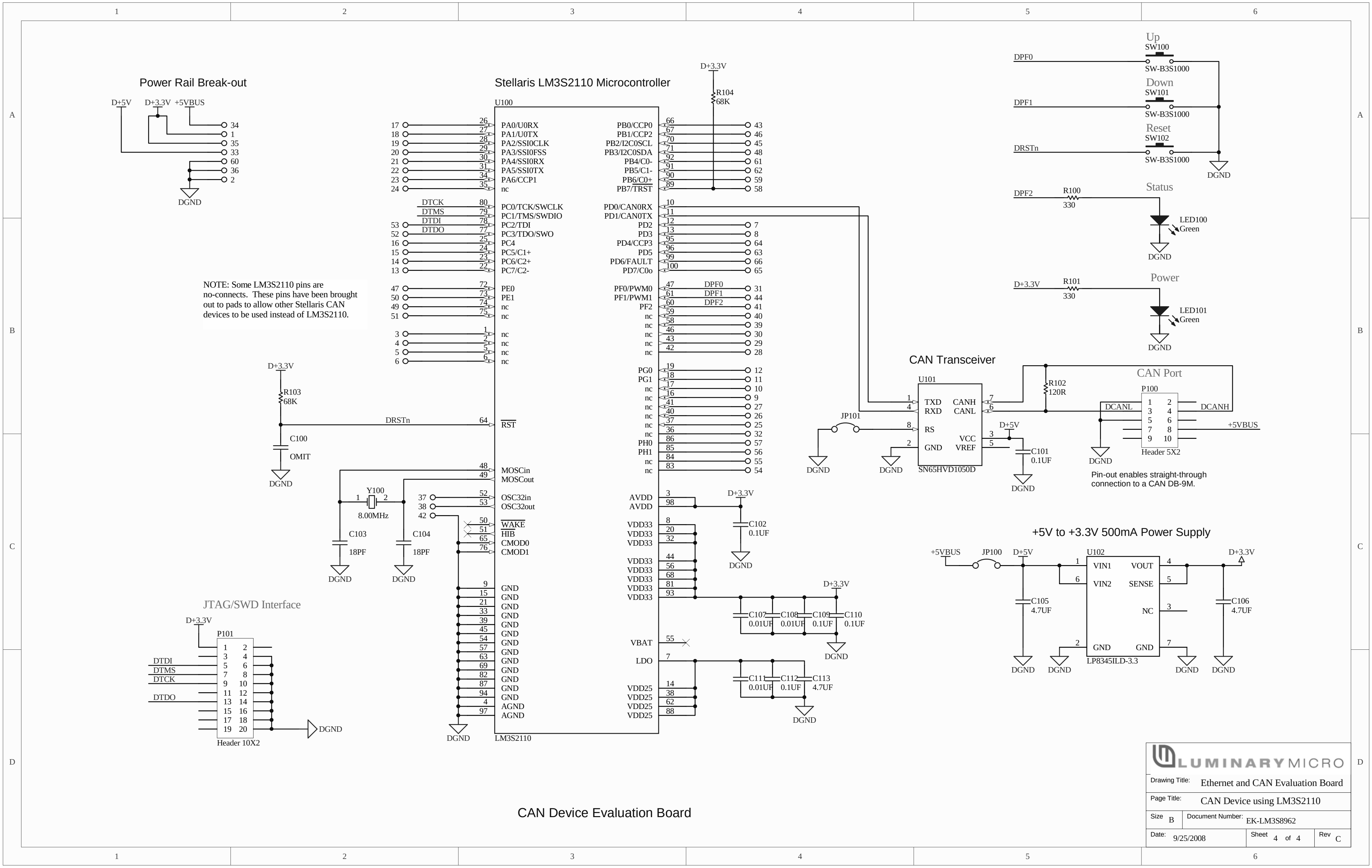
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Page Title:	LM3S8962 Micro, Ethernet and CAN
Size: B	Document Number: EK-LM3S8962
Date: 9/25/2008	Sheet 1 of 4 Rev C

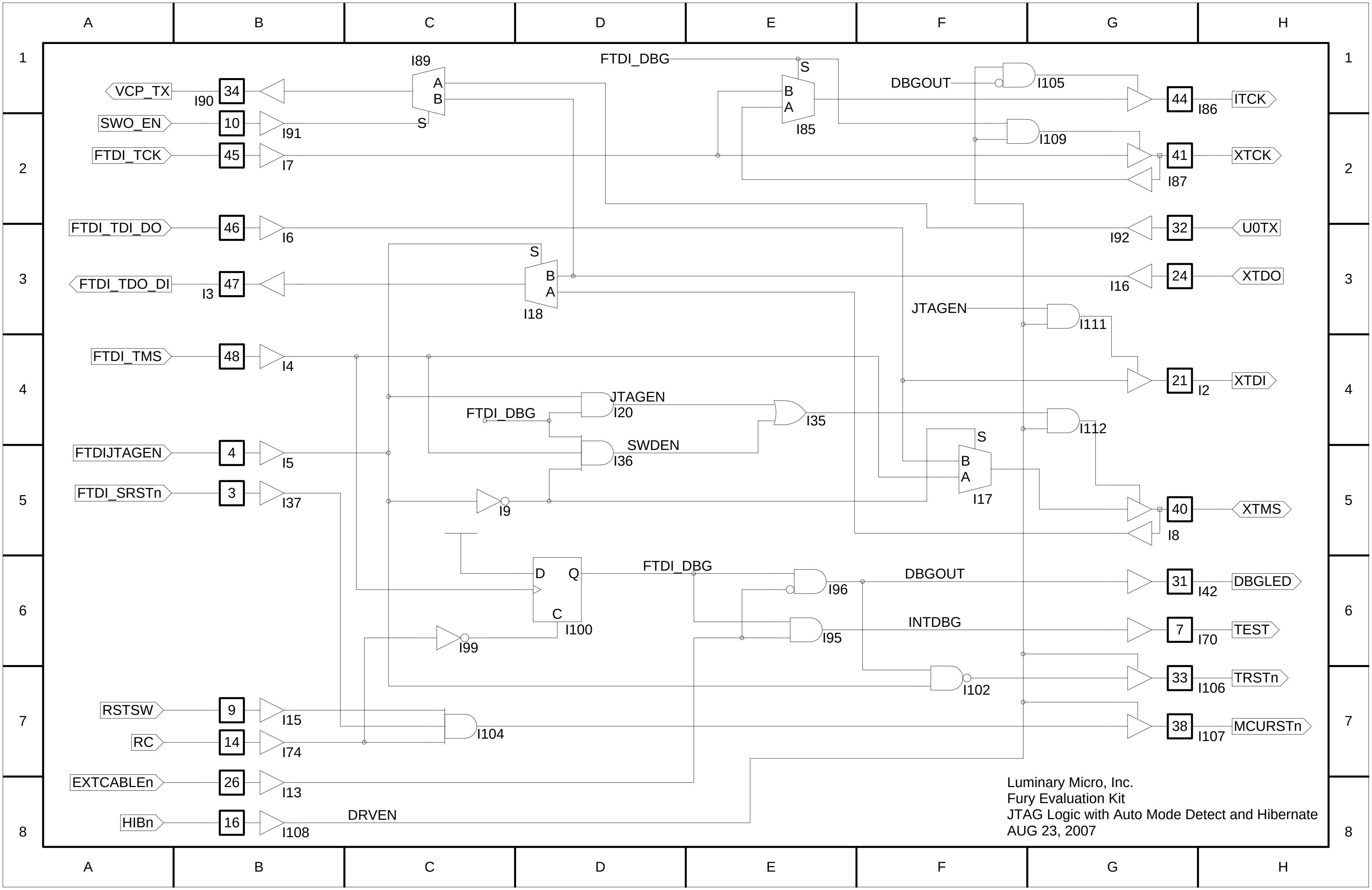


User Switches
+3.3V
R13
10K
Reset
SW1
SW-B3S1000
RESET_SWn
C25
OMIT
Select
SW2
SW-B3S1000
SELECT_SWn
Up
SW3
SW-B3S1000
UP_SWn
Down
SW4
SW-B3S1000
DOWN_SWn
Left
SW5
SW-B3S1000
LEFT_SWn
Right
SW6
SW-B3S1000
RIGHT_SWn
Speaker Circuit
+5V
R11
2.2
D2
MBR0520
BZ1
NFT-03C
SOUND
Q1
NDS331N
R12
10K
128x96 OLED Graphics Display
U3
C22
4.7UF
+3.3V
R10
200K
OLEDCSn
MCURSTn
OLEDDC
SSICLK
SSITX
NC
VCIR
VCOMH
LVSS
VSS
BS1
BS2
IREF
CSn
RESn
D/Cn
R/Wn
E
D0/SCLK
D1/SDIN
D2
D3
D4
D5
D6
D7
VDDIO
VDD
VCC
NC
+15V
C23
0.1UF
C24
0.1UF
OLED-RIT-128X96
RGS13128096WH000
microSD Card Slot
+3.3V
R15
10K
P3
CARDCSn
SSITX
SSICLK
SSIRX
2908-05WB-MG
C26
0.1UF
R17
10K
Status LEDs
LED
R14
330
LED1
Green
Status
DBGOUTLED
R16
330
LED2
Red
Debug Out
R18
330
LED3
Green
Power
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Drawing Title: Ethernet and CAN Evaluation Board
Page Title: OLED Display, Switches and Audio
Size B
Document Number: EK-LM3S8962
Date: 9/25/2008
Sheet 2 of 4
Rev C



Debug Interface Logic
USB Interface
P4
54819-0519
5V D- D+ ID G
USBSH
JP18
USB+5V
FB1
60ohm @ 100 MHz
C32
0.01UF
R21 27
R22 27
R23
1.5K
USB Device Controller
U4
C31
0.1UF
3V3OUT
USBDM
USBDP
ADBUS0
ADBUS1
ADBUS2
ADBUS3
ADBUS4
ADBUS5
ADBUS6
ADBUS7
ACBUS0
ACBUS1
ACBUS2
ACBUS3
SI/WUA
BDBUS0
BDBUS1
BDBUS2
BDBUS3
BDBUS4
BDBUS5
BDBUS6
BDBUS7
BCBUS0
BCBUS1
BCBUS2
BCBUS3
SI/WUB
PWREN#
EECS
EESK
EEDATA
TEST
XTIN
XTOUT
RESET#
RSTOUT#
GND
AGND
VCC
VCCIOA
VCCIOB
AVCC
FT2232D
Channel A : JTAG / SW Debug
Channel B : Virtual Com Port
TCK
TDI/DI
TDO/DO
TMS/OUTEN
SRSTN
DBG_JTAG_EN
VCP_RX
SWO_EN
R35
4.7K
C29
0.1UF
+3.3V
+5V
U5
VCC CS
NC SK
ORG DI
GND DO
CAT93C46
1K 64X16
R24
10K
R25
1.5K
Y3
6.00MHz
C28
18PF
C30
18PF
R30
330
C37
0.1UF
C33
0.1UF
C34
0.1UF
C35
0.1UF
C36
0.1UF
+3.3v
INT_TCK
RESET_SWn
R34
4.7K
C42
0.1UF
MODE is reserved
for future use.
MODE
VCP_TX_SWO
TVCC
U6
LC4032V-75TN48C
GND GND
CLK1/I CLK0/I CLK2/I CLK3/I
TCK TMS TDI TDO
VCC VCC
A0/GOE0
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12
Bank 0
Bank 1
B0 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12
A13 A14 A15
GND (Bank 0)
VCCO (Bank 0)
VCCO (Bank 1)
GND (Bank 1)
B15/GOE1 B14 B13
PC2/TDI
PC3/TDO
TARGETCABLEn
DBGOUTLED
VCP_TX
PB7/TRST
MCURSTn
TMS/SWDIO
TCK/SWCLK
PLD_TCK TP1
PLD_TMS TP2
PLD_TDI TP3
PLD_TDO TP4
TP5
TP6
PLD JTAG TEST POINTS
JTAG/SWD Interface
Input/Output
R26 27
R27 27
R28 27
R29 27
R31 27
XTDI
XTMS
XTCK
XTDO
P5
Header 10X2
R32
4.7K
USB+5V
JP19
U8
VIN1 VOUT
VIN2 SENSE
NC
GND GND
LP8345ILD-3.3
C41
4.7UF
C27
4.7UF
USB +5V to +3.3V 500mA Power Supply
L1
NR4018T100M
10uH
D3
MBR0520
+15V
U7
VIN SW
FB
SHDNn GND
FAN5331
C43
4.7UF
EN+15V
R19
10K
R20
200K
C38
120pF
R33
17.8K
C40
4.7UF
C39
0.1UF
+15V 50mA Power Supply for OLED Display
LUMINARY MICRO
Drawing Title: Ethernet and CAN Evaluation Board
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Power Rail Break-out
D+5V D+3.3V +5VBUS
DGND
Stellaris LM3S2110 Microcontroller
U100
PA0/U0RX
PA1/U0TX
PA2/SSI0CLK
PA3/SSI0FSS
PA4/SSI0RX
PA5/SSI0TX
PA6/CCP1
PC0/TCK/SWCLK
PC1/TMS/SWDIO
PC2/TDI
PC3/TDO/SWO
PC4
PC5/C1+
PC6/C2+
PC7/C2-
PE0
PE1
RST
MOSCin
MOSCout
OSC32in
OSC32out
WAKE
HIB
CMOD0
CMOD1
GND
AGND
LM3S2110
PB0/CCP0
PB1/CCP2
PB2/I2C0SCL
PB3/I2C0SDA
PB4/C0-
PB5/C1-
PB6/C0+
PB7/TRST
PD0/CAN0RX
PD1/CAN0TX
PD2
PD3
PD4/CCP3
PD5
PD6/FAULT
PD7/C0o
PF0/PWM0
PF1/PWM1
PF2
PG0
PG1
PH0
PH1
AVDD
VDD33
VBAT
LDO
VDD25
R104 68K
R103 68K
C100 OMIT
Y100 8.00MHz
C103 18PF
C104 18PF
C102 0.1UF
C107 0.01UF
C108 0.01UF
C109 0.1UF
C110 0.1UF
C111 0.01UF
C112 0.1UF
C113 4.7UF
NOTE: Some LM3S2110 pins are no-connects. These pins have been brought out to pads to allow other Stellaris CAN devices to be used instead of LM3S2110.
JTAG/SWD Interface
P101
DTDI
DTMS
DTCK
DTDO
Header 10X2
Up SW100 SW-B3S1000
Down SW101 SW-B3S1000
Reset SW102 SW-B3S1000
DPF0
DPF1
DRSTn
DPF2
Status
R100 330
LED100 Green
Power
R101 330
LED101 Green
CAN Transceiver
U101
TXD RXD RS GND
CANH CANL VCC VREF
SN65HVD1050D
JP101
R102 120R
C101 0.1UF
CAN Port
P100
DCANL DCANH
Header 5X2
Pin-out enables straight-through connection to a CAN DB-9M.
+5V to +3.3V 500mA Power Supply
+5VBUS JP100 D+5V
U102
VIN1 VIN2 GND
VOUT SENSE NC GND
LP8345ILD-3.3
C105 4.7UF
C106 4.7UF
CAN Device Evaluation Board
LUMINARY MICRO
Drawing Title: Ethernet and CAN Evaluation Board
Page Title: CAN Device using LM3S2110
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Date: 9/25/2008
Sheet 4 of 4



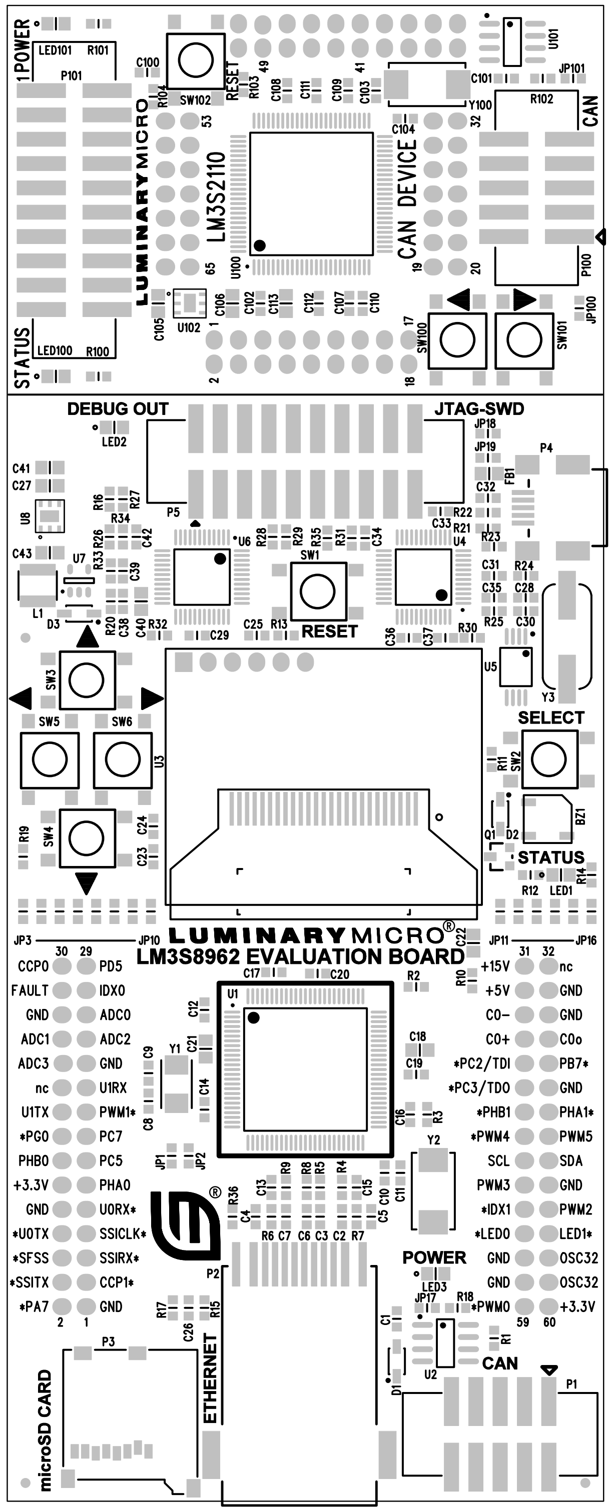
VCP_TX
SWO_EN
FTDI_TCK
FTDI_TDI_DO
FTDI_TDO_DI
FTDI_TMS
FTDIJTAGEN
FTDI_SRSTn
RSTSW
RC
EXTCABLEn
HIBn
DRVEN
FTDI_DBG
DBGOUT
JTAGEN
SWDEN
INTDBG
ITCK
XTCK
U0TX
XTDO
XTDI
XTMS
DBGLED
TEST
TRSTn
MCURSTn
Luminary Micro, Inc.
Fury Evaluation Kit
JTAG Logic with Auto Mode Detect and Hibernate
AUG 23, 2007

Connection Details

This appendix contains the following sections:

Component Locations

Figure B-1. LM3S8962 Evaluation Board Component Locations



Evaluation Board Dimensions

Figure B-2. LM3S8962 Evaluation Board Dimensions

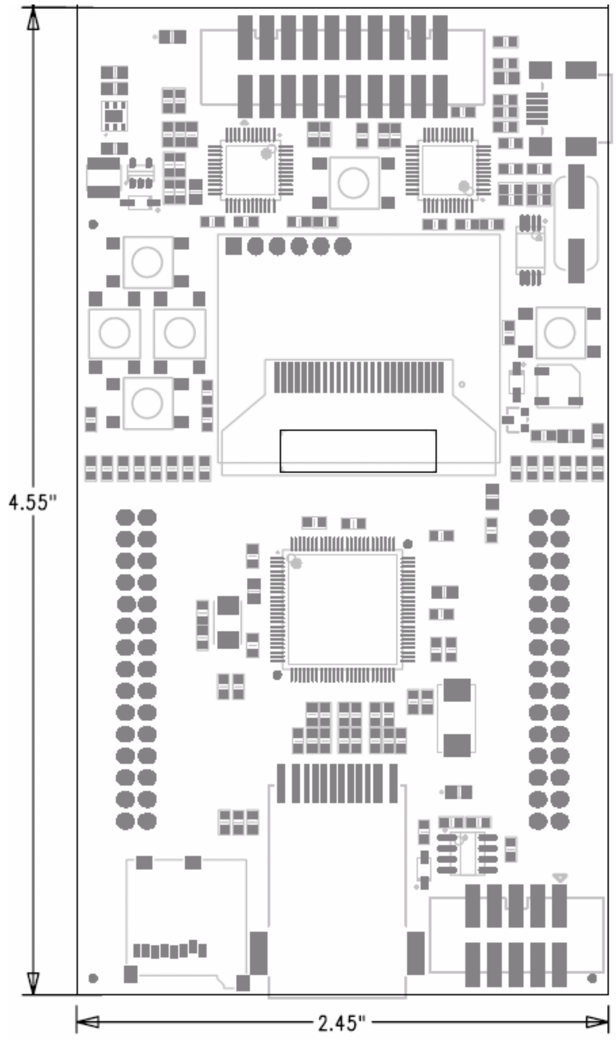
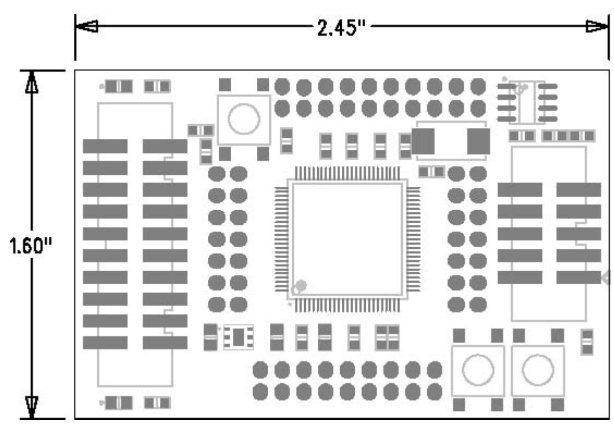


Figure B-3. LM3S2110 CAN Device Board Dimensions



I/O Breakout Pads

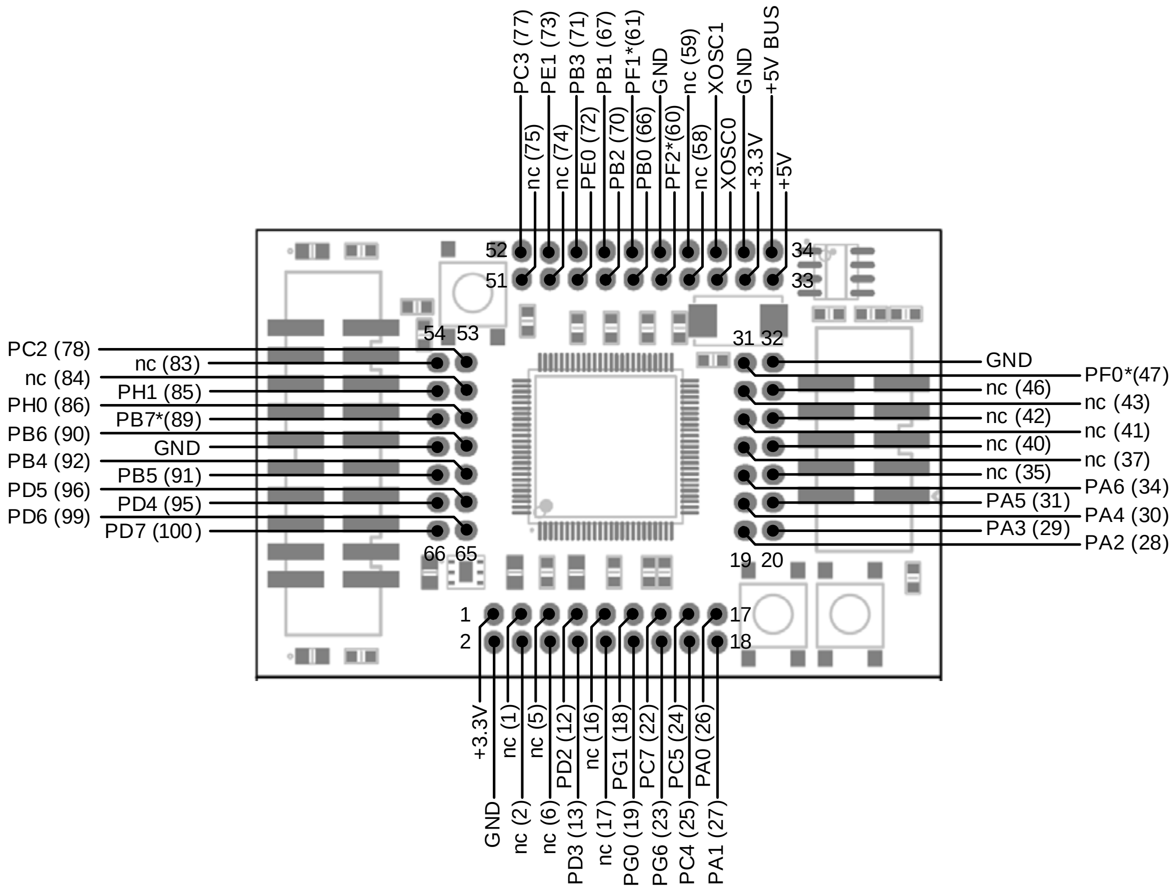
The LM3S8962 EVB has 42 I/O pads, 14 power pads, 2 crystal connections, and 2 no-connects, for a total of 60 pads. Connection can be made by soldering wires directly to these pads, or by using 0.1" pitch headers and sockets.

Note: In Table B-2, an asterisk (*) by a signal name (also on the EVB PCB) indicates the signal is normally used for on-board functions. Normally, you should cut the associated jumper (JP1-15) before using an assigned signal for external interfacing.

Table B-1. I/O Breakout Pads

Description	Pad No.	Description	Pad No.	Description	Pad No.
GND	1	GND	21	PC3/TDO	41
PA7*	2	ADC3	22	GND	42
PA6/CCP1*	3	ADC2	23	PE2/PhB1*	43
PA5/SSI0TX*	4	ADC1	24	PE3/PhA1*	44
PA4/SSI0RX*	5	ADC0	25	PE0/PWM4*	45
PA3/SSI0FSS*	6	GND	26	PE1/PWM5*	46
PA2/SSI0CLK*	7	PD7/IDX0	27	PB2/I2C0SCL	47
PA1/U0TX*	8	PD6/FAULT	28	PB3/I2C0SDA	48
PA0/U0RX*	9	PD5	29	PB1/PWM3	49
GND	10	PD4/CCP0	30	GND	50
PC4/PHA0	11	+15V	31	PF1/IDX1*	51
+3.3V	12	No connect	32	PB0/PWM2	52
PC5	13	+5V	33	PF3/LED0*	53
PC6/PHB0	14	GND	34	PF2/LED1*	54
PC7	15	PB4/C0-	35	GND	55
PG0*	16	GND	36	OSC32OUT	56
PG1/PWM1*	17	PB6/C0+	37	GND	57
PD3/U1TX	18	PB5/C0O	38	OSC32IN	58
PD2/U1RX	19	PC2/TDI	39	PF0/PWM0*	59
No connect	20	PB7/TRST	40	+3.3V	60

LM3S2110 CAN Device Board Connections



Recommended Connectors

Connection can be made by soldering wires directly to pads or using 0.1” pitch headers and sockets.

Table B-2. Recommended Connectors

Pins 1-30, 31-60 (2 x 15 way)	PCB Socket	Sullins PPPC152LFBN-RC	Digikey S7118-ND
	Cable Socket	3M 89130-0101	Digikey MKC30A-ND
	Pin Header	Sullins PEC15DAAN	Digikey S2011E-15-ND

ARM Target Pinout

In ICDI input and output mode, the Stellaris LM3S8962 Evaluation Kit supports ARM's standard 20-pin JTAG/SWD configuration. The same pin configuration can be used for debugging over serial-wire debug (SWD) and JTAG interfaces. The debugger software, running on the PC, determines which interface protocol is used.

The Stellaris target board should have a 2x10 0.1" pin header with signals as indicated in Table B-3. This applies to both an external Stellaris microcontroller target (Debug Output mode) and to external JTAG/SWD debuggers (Debug Input mode).

Table B-3. 20-Pin JTAG/SWD Configuration

Function	Pin	Pin	Function
VCC (optional)	1	2	nc
nc	3	4	GND
TDI	5	6	GND
TMS	7	8	GND
TCK	9	10	GND
nc	11	12	GND
TDO	13	14	GND
nc	15	16	GND
nc	17	18	GND
nc	19	20	GND

ICDI does not control $\overline{\text{RST}}$ (device reset) or $\overline{\text{TRST}}$ (test reset) signals. Both reset functions are implemented as commands over JTAG/SWD, so these signals are not necessary.

It is recommended that connections be made to all GND pins; however, both targets and external debug interfaces must connect pin 18 and at least one other GND pin to GND.

References

In addition to this document, the following references are included on the Stellaris Family Development Kit documentation CD-ROM and are also available for download at www.luminarymicro.com:

- *Stellaris LM3S8962 Evaluation Kit Quickstart Guide* for appropriate tool kit (see “Evaluation Kit Contents,” on page 12)
- *Stellaris LM3S8962 Evaluation Kit Read Me First*
- StellarisWare™ Driver Library
- *StellarisWare™ Driver Library User’s Manual*, publication SW-DRL-UG
- *Stellaris LM3S8962 Data Sheet*, publication DS-LM3S8962
- *Stellaris LM3S2110 Data Sheet*, publication DS-LM3S2110

Additional references include:

- *RiT Display Corporation RGS13128096WH000 OLED Display Data Sheet*
- *Future Technology Devices Incorporated FT2232D Data Sheet*
- Information on development tool being used:
  - RealView MDK web site, www.keil.com/arm/rvmdkkit.asp
  - IAR Embedded Workbench web site, www.iar.com
  - Code Sourcery GCC development tools web site, www.codesourcery.com/gnu_toolchains/arm
  - Code Red Technologies development tools web site, www.code-red-tech.com

Contact Information

Company Information

Luminary Micro, Inc. designs, markets, and sells ARM Cortex-M3-based microcontrollers (MCUs). Austin, Texas-based Luminary Micro is the lead partner for the Cortex-M3 processor, delivering the world's first silicon implementation of the Cortex-M3 processor. Luminary Micro's introduction of the Stellaris® family of products provides 32-bit performance for the same price as current 8- and 16-bit microcontroller designs. With entry-level pricing at $1.00 for an ARM technology-based MCU, Luminary Micro's Stellaris product line allows for standardization that eliminates future architectural upgrades or software tool changes.

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